

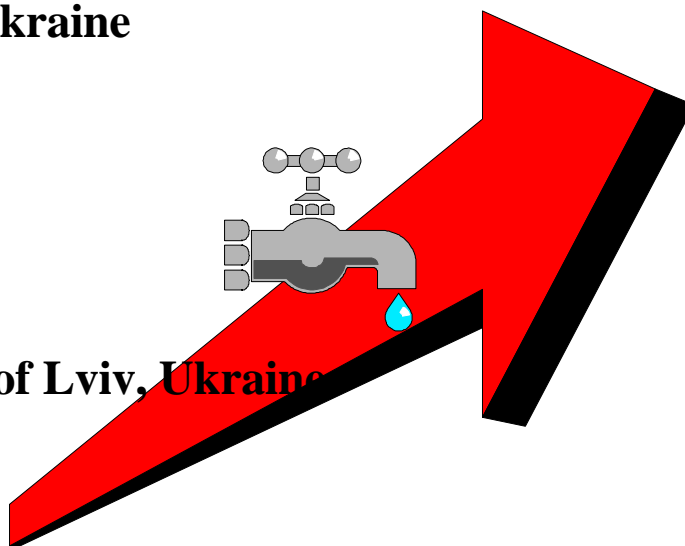
FINAL

IMPROVING COST RECOVERY FOR WATER PROVISION

VOLUME I LVIV VODOKANAL: PRICING PROCESS

Prepared for
Government of Ukraine
and

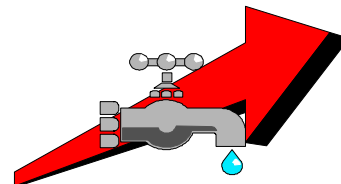
Vodokanal, City of Lviv, Ukraine



Prepared by

PADCO, Inc.

**Contract No. CCS-0008-C-00-2057-00, TO 57
February 1996**



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CHAPTER 1

INTRODUCTION

Planning and Development Collaborative International (PADCO, Inc.) prepared this document for the United States Agency for International Development (USAID) and the Government of Ukraine (GOU) under Task Order 57 of the Shelter Sector Reform Program for the Newly Independent States.¹ Below are presented: (1) context and need for technical assistance, and (2) scope of assignment.

1.1 CONTEXT AND NEED FOR TECHNICAL ASSISTANCE

The fall of the Soviet Union and the winning of Ukrainian independence have challenged Ukrainians *politically* to form a state and govern themselves and *economically* to manage the transition from a command to a market economy. This transition affects all economic sectors, including the provision of basic public services such as drinking water.

The City of Lviv (pop. 850,000) is the economic, academic, and cultural hub of western Ukraine. As in certain other Ukrainian cities,² Lviv residents face severe water shortages. Much of the population receives water service for only six hours a day. Low pressure further restricts water provision in the upper floors of apartment buildings.

Water and wastewater services in Lviv are provided by Lviv Vodokanal. Under the Soviet Union, vodokanals (water/wastewater authorities) were heavily subsidized instruments of the state. In the early 1990s, Lviv Vodokanal legally became an independent public enterprise under control of Lviv City government.³ State- and oblast-level bodies, however, continue to set norms and standards and otherwise influence water provision. Despite its new independent legal status, Lviv Vodokanal's autonomy remains constricted, and its relations with other institutions in the sector may require further change or clarification.⁴

Severe cutbacks in subsidies from the state, as well as demands from customers, impel Lviv Vodokanal to seek to generate more revenue to improve water service. One way to increase

¹ USAID/PADCO Contract No. CCS-0008-C-00-2057-00.

² For example, Berdicher and Shitomir. Source: Stottmann, Walter, *Ukraine Municipal Water and Wastewater Sector Study*, World Bank, 15 May 1995, p. 3.

³ The law of 27 September 1991 established vodokanals as legally independent state-owned enterprises, while the Local Self Government Act of 1992 (together with Decree of 12 March 1994) transferred responsibility for municipal services to local governments.

⁴ For further details of institutional context, see: USAID/Ukraine, *Project Design for Joint Vodokanal Demonstration and Assistance Project in Lviv, Ukraine*, 1995; or Stottmann, Walter, *Ukraine Water and Wastewater Sector Study*, World Bank, Draft, 15 May 1995. As noted below, PADCO, Inc. is investigating legal/institutional aspects of Lviv Vodokanal, under Task Order 53 of the same USAID contract.

financial self-reliance would be to set water user charges to achieve greater cost recovery. That approach is the subject of the present assignment.

Two factors underscore the urgency of improving cost recovery through user charges for Lviv Vodokanal. First, Government pronouncements call for vodokanals to make improvements in cost recovery. As amended by mid-1995, the Cabinet of Ministers Decree No. 733 called for the population to begin to assume larger amounts of the actual costs of water provision as follows:

- by 1 May 1995, not less than 30 percent of actual costs; and
- by 1 June 1995, not less than 40 percent of actual costs.⁵

(At the same time, the Government also seeks to protect the poorest from having to pay too much of their income. According to their April 1995 Reg. No. 295, the Cabinet of Ministers established that families should not pay more than 15 percent of their average total monthly income for housing and communal services.)

As a second impetus toward greater cost recovery, World Bank and Lviv officials have signed an Aide Memoire concerning a proposed water and wastewater project in Lviv. Rapid increases in cost recovery, as well as the final size of the project and loan, would strengthen the likelihood that this proposal will actually materialize. As the Aide Memoire states, "The size of the project and the Bank loan will ... depend foremost on the ability of Lviv Vodokanal to generate resources from water ... tariffs."⁶

1.2 SCOPE OF ASSIGNMENT

1.2.1 Overall

Under the Shelter Sector Reform Program, USAID is assisting Lviv Vodokanal to improve its water service provision by means of a demonstration and assistance project. To accomplish this goal, the Project Design⁷ sets out five project components, to be executed by PADCO, Inc. and another contractor working in coordination as follows:

⁵ Source: Cabinet of Ministers, Decree No. 733, *On Pricing under the Conditions of Economic Reform*, effective 21 October 1994; and Resolution No. 86, dated 4 February 1995.

⁶ World Bank and City of Lviv, *Ukraine Proposed Water and Wastewater Project: Aide Memoire*, 30 May-1 June 1995 Mission, p. 2.

⁷ See USAID/Ukraine, *Project Design for Joint Vodokanal Demonstration and Assistance Project in Lviv, Ukraine*, 1995.

#	Activity	Contractor and Task Order #
1	Improving cost recovery	PADCO / TO 57
2	Priority repair or upgrading of facilities	CH2MHill
3	Metered water use	CH2MHill
4	Legal aspects of water provision	PADCO / TO 53
5	Strategic plan for future institutional setup	CH2MHill

The present assignment, *Improving Cost Recovery for Water Provision*, addresses Activity 1 above.⁸ The assignment involves completing four major deliverables:

Volume I: *Lviv Vodokanal: Pricing Process* (the present volume)

Volume II: *Lviv Vodokanal: Improving Cost Recovery*

Volume III: *Manual for Improving Cost Recovery*

Volume IV: *Final Report*

Through the first two volumes, PADCO provided technical assistance directly to Lviv Vodokanal. As per the Terms of Reference, the final two volumes capture lessons learned in Lviv, and address potential “roll-out” of activities to other Ukrainian vodokanals. Field work for the present assignment was completed in Lviv between July and October 1995.

1.2.2 Present Study

Lviv Vodokanal: Pricing Process refers to the way monthly charges are set for water use. The report was drafted in July 1995 and translated into Ukrainian. PADCO discussed principal findings with local and USAID officials in a workshop/seminar held on 1 August 1995,⁹ and solicited written comments. The present, final version incorporates comments received.

Following this introductory *Chapter 1*, the document proceeds as follows:

- *Chapter 2* compares the current pricing process with a model process, and
- *Chapter 3* offers recommendations.

⁸ See Appendix A: PADCO, Inc., *Task Order 57 Terms of Reference*, 29 June 1995.

⁹ For information on workshop, see *Volume IV: Final Report*.

CHAPTER 2

COMPARISON OF CURRENT AND MODEL PRICING PROCESSES

Officials set monthly user charges for water provision by means of a pricing process. A model pricing process exists that satisfies the needs of many self-sustaining water authorities. This model process differs in important respects from the process, based on national guidelines, that is currently used by the Vodokanal in Lviv. To compare the current and model pricing processes, below we: (1) introduce criteria for making such a comparison, (2) briefly describe the current pricing process, (3) briefly summarize the model pricing process,¹⁰ (4) compare the two systems, and (5) draw conclusions.

2.1 CRITERIA FOR COMPARISON

When evaluating an approach to pricing, analysts must ask whether the process in question will help the water authority do the following.

Be self-sustaining. A utility is financially self-sustaining if it receives enough revenue (from user charges and other sources) to allow it to continue to provide adequate service indefinitely. For a utility that provides full water services, this involves paying for all operating and maintenance expenses, reviewing and replacing existing capital equipment, and extending and expanding the water system as necessary.

*Charge customers in an efficient and fair manner.*¹¹ One can say that it is both fair and efficient to charge each customer for the costs of the water he or she consumes. This allows prices to act as a *signal* to consumers. If prices signal that water is inexpensive and plentiful, they may choose to consume more; if prices show the commodity is precious, they should consume less. Customers will only consume what they can afford.

Provide a minimum service to the most disadvantaged, and meet other public goals. While the efficiency and fairness principle mentioned above should serve as an underlying goal of pricing, the pricing structure can also reflect other objectives, such as social and water conservation goals.

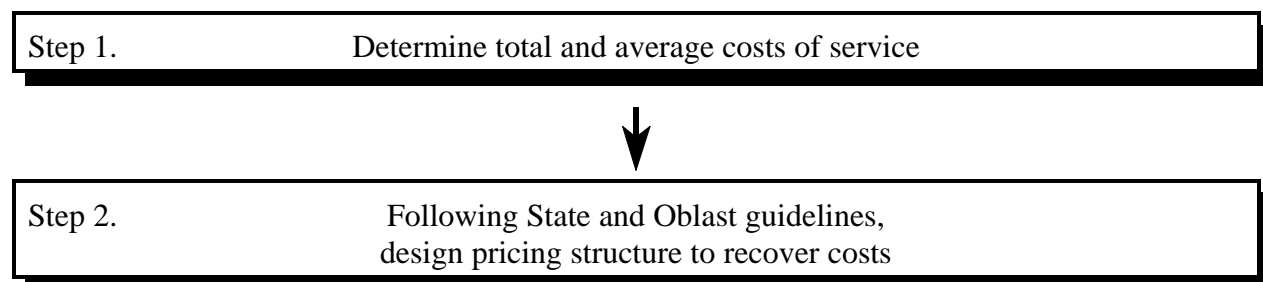
Make decisions based on clear, understandable information. The process (as well as the accounting system that provides the data used in the pricing process) should accurately and logically account for costs.

¹⁰ For more detailed descriptions of the current and the model pricing processes, see Appendices B and C, respectively. For an example of use of the current pricing process by Lviv Vodokanal (May 1995), see Appendix D.

¹¹ That is, achieve allocative efficiency.

2.2 CURRENT PRICING PROCESS

Whenever Lviv Vodokanal wishes to change the prices it charges to customers, Vodokanal officials develop a proposed price structure and submit it to Lviv Oblast for approval. To develop the proposed price structure, Vodokanal officials follow a two-step process:



In Step 1, officials first project future operating and maintenance expenditures, based on historical trends and other factors, such as sudden increases in the price of electro-energy. Asset values are then depreciated based on their expected service life and indexed for inflation, according to norms provided by the State. Finally, estimated taxes are added to arrive at total projected expenditures.

Also in Step 1, Vodokanal officials calculate aspects of water production and delivery. They project total water production based on historic records. Officials next calculate water delivery to different customer classes. Lviv Vodokanal recognizes four main categories of customer:

- general population;
- organizations on Lviv City budget (e.g., local government);
- communal service providers (e.g., banks, gas stations, etc.); and
- enterprises/industries.

Estimates of water use are based on State norms and some meter readings. Officials next estimate water loss. Finally, “average cost” is calculated by dividing total future expenditures by total water delivered.

In Step 2, officials first set user charges for those customer classes where State and Oblast guidelines and precedents prevail — communal service providers, the general population, and Lviv budget organizations. For example, following State decrees, the charge for the “general population” class is pegged at 30 percent of “average cost.” Vodokanal officials next project the revenue that will be generated by those sources, based on water planned for delivery to those groups. Finally, the charge for industry is set so as to recover the remainder of future revenue required.¹²

¹² Besides the citations presented above, one notes that at least one regulation defines additional elements of a price structure: *Regulations on Utilization of Communal Water Supply and Sewage Systems in Cities and Villages of Ukraine*, issued by the State Committee of Housing and Communal Services, effective October 1994. That regulation provides that citizens who exceed water usage norms should pay double current prices, while enterprises and organizations that

(continued...)

Over the last year, price structures have changed every two or three months, due mostly to the sharply rising costs of electro-energy and the effects of inflation. The price structure that took effect on 1 June 1995 is presented in Table 2.1. One observes that enterprise/industry pays a much higher price (nine times the "average cost") for water use than other consumers.

Table 2.1
Current Price Structure for Water Provision (effective 1 June 1995)

Customer Group	Price per Cubic Meter of Water	
	Coupons (C)	US\$
Communal Services	C. 16,800	0.11
General Population	C. 5,050	0.03
War Veterans	C. 1,270	0.02
Persecuted	C. 2,530	0.01
Etc.	—	—
Lviv Budget Organizations	C. 6,070	0.04
Enterprises/Industry	C. 153,000	1.00
NOTES: US\$1 = Ukrainian coupons 153,000. "Average cost" = C. 16,815 (US\$0.11).		

2.3 MODEL PRICING PROCESS

The model pricing process¹³ generally follows marginal cost principles. When we set the price for water service equal to marginal costs, we send the correct price signal to use water efficiently. If prices are too high, we in effect sell too little water. If prices are too low, we sell too much water.

The marginal cost of water is the cost of producing and selling *the next* unit of water. Thus, this approach to price-setting is forward-looking, rather than based on sunken or historical costs, as are other approaches. Because it is based on future conditions, calculating marginal costs involves projecting capacity and operating costs for a future time span.

In practice, it is not practical to set water prices exactly equal to the marginal cost. The average incremental cost (AIC) approach offers a reasonable way to approximate the marginal cost of water. The AIC definition gives cost estimates that avoid the severe price fluctuations that a

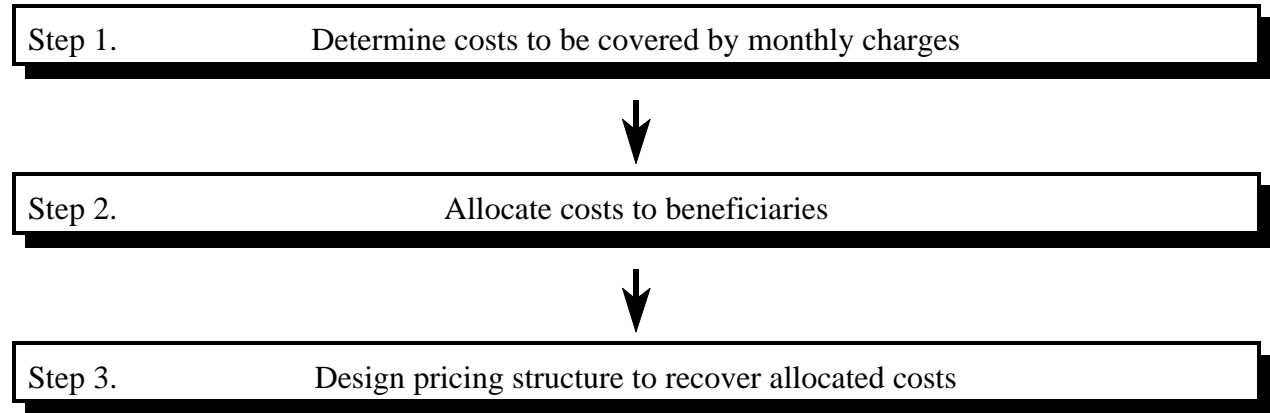
(...continued)

exceed proscribed limits should pay five times current rates (Section 9.5). This regulation, which specifies what are in effect user charges, is applied infrequently, if at all, in Lviv because chronic water shortages prevent customers from exceeding the norms, and because the data needed to apply this additional charges are usually not available.

¹³ See Appendix C for sources.

purely marginal cost approach to water pricing would produce. Even as early as 1977, the World Bank was using the AIC definition in many water supply projects.¹⁴

The steps in the model pricing process using the AIC approach are as follows:



Step 1 involves determining average incremental costs, based on a discounted projection of future revenue needs. The monthly charge really has two components. A *volume* charge reflects costs that vary, depending on the amount of water consumed. The *service* charge, on the other hand, includes costs that remain fixed and do not vary depending on the volume of water consumed. Service charges often include costs associated with billing, customer service, administration, etc.

Step 2 recognizes that, "following the general principle of efficient pricing, water users should be charged equally if they impose equal marginal costs on the system, but should be charged differentially if marginal costs differ."¹⁵ Customer demand patterns and resulting costs generally do vary. Thus, in Step 2, we continue refining the *volume* charge. (The customer *service* charge, derived in Step 1, will, however, remain unchanged.)

In Step 2, costs are divided into their primary components. These components are:

- *base costs* that are based on the total quantity of water used;
- *extra capacity costs*, associated with meeting variations in water use, e.g., costs to meet maximum-day extra demand; and
- *direct fire-protection costs* associated with providing fire protection.

One next allocates costs to customer classes. Specialists try to divide customers into groups that have similar characteristics of water use. Costs are then allocated on the basis of the varying costs involved with serving those different types of beneficiaries. For example, costs may be

¹⁴ Sanders, Robert; Warford, Jeremy; and Mann, Patrick, *Alternative Concepts of Marginal Cost for Public Utility Pricing: Problems of Application in the Water Supply Sector*, World Bank, Staff Working Paper No. 259, May 1977, p. 26.

¹⁵ Bahl, Roy W. and Linn, Johannes F., *Urban Public Finance in Developing Countries*, 1992, p. 302.

lower for customers who may be satisfied only with untreated water. Similarly, costs may be higher for customers whose water demand varies widely during the day, or who demand higher levels of service.

The third step is designing a pricing structure to recover allocated costs. One first makes some basic decisions about the price structure, beginning with the objectives that the structure should help achieve.¹⁶ Analysts next develop "rate blocks" to recover costs related to volume of use (*base costs*) and *extra capacity*. *Direct fire-prevention costs* are then provided for. Then one calculates whether this initial rate structure will meet revenue requirements and other objectives of the water authority. If not, the initial rate structure is revised until it meets objectives.

2.4 COMPARISON OF CURRENT AND MODEL PRICING PROCESSES

Based on the criteria presented in Section 2.1 above, we compared and evaluated the current and model pricing processes. Similarities and differences are as follows.

Both the current and model processes are examples of *cost-based pricing*. That is, the amounts actually charged to customers (i.e., prices) are based on some calculation of the resources required to provide a service (i.e., costs). Despite this underlying similarity, the following key differences exist between the two approaches.

2.4.1 Definition and Calculation of Total Costs

The two processes define total costs differently. This discrepancy arises largely from differing assumptions about the responsibilities of the water authority in question. Under the *current* scenario, the Vodokanal pays for operations and maintenance (O&M) and system renewal and replacement, while the City pays for system extension and expansion. Under the *model* scenario, on the other hand, the Vodokanal, acting as a utility, would assume responsibility for all of the above types of service. As a result, the current tariff-setting process only attempts to cover O&M and renewal and replacement costs, with no provisions for extending and expanding the system.¹⁷

Further, the two processes approach costing from a different perspective. The current approach is based largely on historic costs, while the future approach relies on projections of future costs. The model approach is theoretically superior for helping a water authority become self-sustaining and charging in an efficient and fair manner. The current process, on the other hand, is simpler, requiring less planning and data gathering.

The current process apparently does not fully reflect all costs associated with sustainable operation, maintenance, renewal, and replacement. Current prices do not reflect, for example, debt owed by the Vodokanal for electro-energy. Nor do they realistically reflect the high rates of

¹⁶ Objectives can include: helping the water authority operate on a self-sustaining basis, promoting water conservation, promoting economic development in certain parts of a city, etc.

¹⁷ For description of responsibilities and the financial model under the current scenario, see *Volume II: Lviv Vodokanal: Improving Cost Recovery*, Chapter 1.

nonpayment of bills from water customers. Those costs would all be included under the model process.

2.4.2 Allocation of Costs and Design of Price Structure

A major difference between the two processes is how prices are set for different customer groups. The model process includes a separate calculation — “allocate costs to beneficiaries” — to ensure that different groups bear the particular costs associated with their pattern of water use. This is more economically efficient than the current process. Under the current process, customer groups pay varying prices for reasons not associated with cost. Instead of promoting efficiency, prices under the current system appear to vary based on two customer characteristics.

- *Perceived ability to pay for standard service.* This perceived ability to pay is embodied in various State and Oblast decrees, for example, the gradual phase-in of cost recovery to the general population, lower prices for certain disadvantaged groups, etc. One notes that this perceived ability to pay is determined largely at the State and Oblast level, not at the local level.
- *Ability to be collected from automatically for actual water use.*¹⁸ Customers that can be collected from automatically (e.g., industries) generally pay higher prices for service. Automatic collections permit better enforcement of rates and more reliable revenue generation. Officials may therefore try to increase revenue generation by assigning higher prices to these more “chargeable” groups.

Setting prices based on those criteria creates a cross-subsidy that severely distorts economic decision-making. It places an enormous burden unfairly on enterprise/industry customers, causing them to reduce water use, curtail their production, or even close their doors. Residents and communal service providers, on the other hand, experience no incentives to conserve water.

Finally, the pricing process could provide clearer information to decision-makers about certain costs. The process could, for example, account more clearly for the provision of legally mandated free services, such as for fire protection.

A further, operational drawback of the pricing process is that the price structures it produces must be updated frequently, due to inflation and escalations in the costs of inputs, such as electro-energy. The necessity of recalculating and resubmitting proposed changes in prices every several months burdens Lviv Vodokanal’s administrative capacity. Innovations in the price structure could permit more automatic increases due to the effects of inflation or rising energy costs.

2.5 CONCLUSIONS

The following conclusions about the potential use of the model pricing process by Lviv Vodokanal are preliminary. Based on a more in-depth analysis, our Volume II study offers a series of detailed recommendations on improving cost recovery and price-setting in Lviv, as well as

¹⁸ For description of billing and collection process, see *Volume II: Lviv Vodokanal: Improving Cost Recovery*, Chapter 3.

national-level recommendations. The Volume IV report includes recommendations for ongoing technical assistance in Lviv, including improving the tariff-setting process.

We conclude that trying to *fully* implement the model pricing process in Lviv is not appropriate at this time, but should rather be introduced in phases that keep step with changes in the national legal framework. We draw this conclusion in spite of the theoretical advantages of the model approach in terms of economic efficiency. Our reasons are as follows.

- *The model process, if fully implemented, would assume a role for monthly user charges that is, at present, inappropriate.* The model process assumes that monthly charges will reflect future costs of system extension and expansion. Currently in Lviv, the City, rather than the Vodokanal, is responsible for capital extension and expansion. Thus, the Vodokanal's monthly charges do not need to reflect those costs.
- *The legal framework would not, at present, permit vodokanals to fully embrace the model pricing process.* Rules tightly constrain officials as to how costs are calculated and passed on to consumers.¹⁹ Under those rules, the calculation of renewal and replacement costs for capital goods is based on historic records, not on future projections as in the model process. Other cost items that form a part of the model process are excluded altogether under current rules.

Changing the national legal framework, for example to permit vodokanals to expand the list of items included in their calculation of costs, thus appears critical.

While *fully* adopting the model process is currently not appropriate or even possible in Lviv, certain elements of the model process should be incorporated in the near future. The following elements of the model process would improve economic efficiency, would appear to require no changes in the nation's laws, and should thus be considered for near-term adoption by the Vodokanal.

- *The economic allocation of costs to customer groups.* The legal framework appears to permit, and even encourage, adoption of this key feature of the model process. A recent Government publication says that, "The estimated prices and tariffs [for the general population] are calculated, taking into account the specific natural and demographic features of a residential area."²⁰ Such a calculation represents, in effect, an economic allocation of costs to different customer groups. Prices set under the current method, on the other hand, are grossly unfair to certain customers, namely to enterprises/industry, and thus distort economic decision-making.
- *Division of monthly charge into two components: a volume charge and a service charge.* This change would improve the efficiency of pricing, and would not appear to be prohibited by current law.

¹⁹ See, for example, Cabinet of Ministers Decree No. 759, *Main Statements on the Productions Costs Estimations for Enterprises and Organizations*, 10 November 1994.

²⁰ Government of Ukraine, *New System of Payments for Housing and Municipal Services and Their Subsidies for Special Categories of Citizens*, received by Lviv Vodokanal in July 1995.

These changes would have benefits (improved economic efficiency), but at some cost (additional effort required to gather and analyze the data necessary). Recommendations related to these points and others are provided in Volumes II and IV.

APPENDIX A

TERMS OF REFERENCE

USAID/PADCO Contract No. CCS-0008-C-00-2057-00
RK / 29 June 1995

PRICING STRATEGIES TO INCREASE COST RECOVERY FOR WATER PROVISION BY VODOKANAL IN LVIV, UKRAINE

3 Background and Summary

These Terms of Reference describe activities that PADCO will execute between the date of approval and 30 September 1995, under Task Order (TO) No. 57 of USAID Contract No. CCS-0008-C-00-2057-00, a part of USAID's Newly Independent States (NIS) Shelter Sector Reform Project. The Terms of Reference assume a date for starting work in Lviv of Monday 10 July 1995. As discussed below, certain of the recommendations developed under this TO would provide input into the scoping of any follow-up activities realized after 30 September 1995.

3.1 Need for Technical Assistance²¹

The Vodokanal in Lviv, Ukraine provides potable water and wastewater services to the citizens of Lviv. As with other communal services in the Ukraine, costs are not currently fully recovered. On average, families using housing and communal services currently pay for only about 10 percent of the total costs of providing those services. The reasons for this low rate of cost recovery include water system losses, inadequate metering, ineffective maintenance provided by zheks, and a subsidized pricing structure that is not grounded on a full understanding of the costs of service provision.

On 11 October 1994, President Kuchma announced widespread economic reforms designed to change communal service provision in the Ukraine. The President removed central government controls over many prices and announced steps designed to move communal services (including water provision) toward full cost recovery. According to these reforms, families will be required to shoulder at least 60 percent of the costs of providing housing and communal services during 1995.

Even without the impetus of Presidential-led reform, cost recovery should serve as a central organizing principle in the decision-making of a public service provider such as Lviv Vodokanal. While achieving full cost recovery may not always be desirable for public service provision (e.g., when significant positive externalities are involved), explicit information about the degree to which costs are generated permits officials to weigh trade-offs, permitting informed decision-making. While possession and use of cost data is thus crucial to effective

²¹For more details, see USAID, *Project Design for Joint Vodokanal Demonstration and Assistance Project in Lviv, Ukraine*, 1995.

utility administration, providers of communal services such as Lviv Vodokanal are often not accustomed to using or even developing this fundamental information.

3.2 Project Design and Coordination

Responding to the need for technical assistance and in accordance with USAID strategic objectives, USAID's "Project Design for Joint Vodokanal Demonstration and Assistance Project in Lviv, Ukraine" (1995) described five components to be executed under USAID's Shelter Sector Reform Project. Of those five components, two correspond to the PADCO contract, while three relate to a contract with CH2MHill, as follows:

#	<u>Activity</u>	<u>Contractor and Task Order #</u>
1	Improving cost recovery	PADCO / TO 57
2	Priority repair or upgrading of facilities	CH2MHill
3	Metered water use	CH2MHill
4	Legal aspects of water provision	PADCO / TO 53
5	Strategic plan for future institutional setup	CH2MHill

These Terms of Reference thus refer to only the first of those five activities, TO 57. The Project Design paper stresses coordination among the teams that carry out the five Project activities. The TO 57 team particularly anticipates coordinating on a day-to-day basis with the USAID/PADCO Resident Advisor in Lviv, who will supervise completion of activity four under TO 53.

Regarding coordination with CH2MHill, PADCO proposes holding periodic coordination meetings while in-country with CH2MHill personnel, providing draft documents to CH2MHill personnel for their review and comment, and reviewing draft documents as requested by CH2MHill. PADCO consultants will also participate as appropriate in the Ukraine-American Joint Working Group Program to be conducted by CH2MHill staff.

The Task Order team will also coordinate with a consultant (COWIConsult) expected to conduct a feasibility study of Lviv Vodokanal, an externally funded consultant who is reportedly now assisting Lviv Vodokanal with upgrading its financial data system, as well as with World Bank-funded assistance that is currently planned for the Vodokanal regarding possible privatization of the utility and operations management. Regarding local counterparts, PADCO technical experts anticipate coordinating with the Lviv Deputy Mayor, in addition to Vodokanal officials and others as appropriate.

4 Objectives

Developing accurate cost data and a pricing strategy that reflects that information would take Lviv Vodokanal a considerable way toward fulfilling President Kuchma's goal of increasing cost recovery for communal services. TO 57 thus seeks to realize the following major objectives:

- Assist Lviv Vodokanal move toward sustainability in its water provision by heightening its appreciation of the *costs* involved in service provision, and developing a *pricing strategy* that addresses full cost recovery;

- Ensure the *sustainability* of the effort by providing Lviv Vodokanal with heightened capacity and an ongoing process for pricing and analyzing the performance of user charges; and
- Address *replicability* by developing recommendations and a manual for similarly assisting other vodokanals.

Full cost pricing, a concept central to the Task Order objectives, involves setting utility charges at a level that recovers all costs associated with provision of a service (e.g., costs of operations, maintenance, capital, overhead, debt service, etc.). Bearing in mind full cost recovery as an eventual planned goal, the strategy will emphasize pragmatic, immediate steps to begin recovering more of the service costs. While the team will focus on recovering costs via a pricing strategy, the team will bear in mind that such an approach should be nested within the broader objectives of the utility regarding revenue generation and service provision.

While the *pricing strategy* will include a new price structure, it will also embrace related elements, such as pricing policies, an ongoing mechanism for consultation, and a plan for phasing in new prices. To achieve actual increases in revenue, it may be necessary to link elements of the pricing strategy *per se* with other aspects of service provision (e.g., installation of meters, service improvements). The team will seek a workable strategy in two ways. First, to cultivate commitment to the final plan, the PADCO technical experts will consult with a certain number of key stakeholders — including consumer groups and zheks — while developing the strategy. Second, the consultancy will base the strategy on a realistic assessment of the Vodokanal's legal rights and political will vis-à-vis the pricing of services. To be achievable, the strategy will focus on those cost-recovery tools that fall most directly within the Vodokanal's immediate sphere of control and influence.

The PADCO team will collect data as necessary and available, accepting the current system of financial data management (reportedly now being upgraded under a separate donor-assisted activity) as a given. The team will focus on charges to current water system users, rather than fees for new hook-ups. Analysis of wastewater services, a second activity area of the Vodokanal, is outside the scope of the Task Order.

While the objectives are deliberately focused on specific aspects of financial management leading to concrete results given limitations of time and level of effort (LOE), carrying out the assignment will bring the TO 57 team into contact with many other aspects of water service administration. To the extent possible given time constraints, the technical experts will generate recommendations concerning other, non-pricing aspects of financial management and service provision. However, those other recommendations are not expected to be comprehensive and will be at a general level of detail.

5 Activities

To realize the objectives, in consultation with counterpart officials, the consultancy will carry out a series of activities (sub-tasks). To use resources most efficiently, those sub-tasks will be grouped into three implementation phases as shown below.

PHASE I: LVIV

In Lviv, the Task Order team will perform the following tasks:.

Sub-Task 1 — Collect Necessary Data

Before leaving the United States, the team will prepare a draft list of data to collect while in Lviv. The team will collect those data from the Vodokanal and other sources.

Sub-Task 2 — Describe Setting and Service Provision

The PADCO team will generally describe those aspects of the setting that most bear on the task at hand. The team will generally describe: the City of Lviv, the Vodokanal, its assets, the service provided, current metering practices, and other relevant background information. The team will describe those institutions and laws that specifically affect price policy for water provision in coordination with the USAID/PADCO Resident Advisor in Lviv, who is programmed to complete Task Order 53 as noted above. Based on secondary data available and discussions with consumers and zheks, the team will generally characterize different groups of water service consumers and their ability to pay for water service.

Sub-Task 3 — Determine Costs; Evaluate Revenue Performance of Current Utility Charges

The team will describe past and present utility charge structures and policies.

The technical experts will next determine the total costs of providing water service.²² The team will then perform three analyses of the revenue performance of utility charges.

- *Cost recovery analysis* — comparing the total amount of revenue collected to the total cost of providing the service.
- *Revenue per unit of service analysis* — involving calculations of:
 - revenue per cubic meter;
 - cost per cubic meter;
 - rate charge per cubic meter;
 - built-in subsidies (i.e., difference between the unit cost of supplying water and the water rates); and
 - actual subsidies (i.e., difference between the revenue collected and the cost of providing the service).
- *Collection efficiency analysis* — comparing total charges due with those actually collected.

To permit trend analysis, as feasible, the team will perform these analyses for both current and past years. Performing cost recovery analysis will involve deciding/proposing: an appropriate definition of “cost,” which costs to attribute to water provision, on what basis (if at all) to include capital costs, etc. Carrying out revenue per unit of service analysis will involve deciding whether

²²Depending on the quality of data currently available, the team will attempt to disaggregate the costs of water provision by the various system *activities* (supply, treatment, transmission and distribution, service connection, fire service, metering and billing, and administration [this latter item will be further broken down as possible]), by their *component parts* (labor, energy, supplies, maintenance, vehicle operation, capital improvements, other), and/or by different *categories of user*.

to consider particular units of service or pooled average expenses. As appropriate, the team will present results in both graphic and tabular form.

The team will then make explicit and justify criteria for evaluating revenue performance (e.g., sustainability, equity, etc.). Finally, using results of the above three analyses, the consultancy will draw conclusions regarding the revenue performance of the price structure currently used by the utility.

Sub-Task 4 — Develop and Implement a Consultation Plan

At the beginning of the exercise, the team will discuss the scope of work with Vodokanal and City officials and others as necessary. The team will seek to involve Vodokanal officials as much as possible in analyses performed, incorporating one representative in the team if appropriate.

In consultation with Vodokanal representatives, City officials, and persons carrying out Task Order 53, the team will identify key stakeholders, consumer representatives, and others (e.g., zheks) concerned with pricing policy. Consultation will be focused on key persons and groups and will not be all-inclusive. The team will then craft and implement a plan for consulting with those stakeholders during execution of the Task Order and preparation of the pricing strategy.

As one element of that consultation plan, following completion of Sub-task 3 described above (evaluation of revenue performance), the consultancy will organize, design, and conduct a workshop (or series of workshops) for key stakeholders concerning the analysis results. At those workshops, the team will also present key concepts (e.g., cost recovery, price as a mechanism for equating supply and demand, differential rates and subsidies, etc.). From a discussion and validation of the diagnosis, the team will guide discussion toward proposed remedies: changes in policy, pricing structures, etc. The team will structure the discussion as appropriate, for example, through the use of decision papers.

PHASE II: WASHINGTON, D.C.

The team will perform the following sub-tasks in Washington, D.C.

Sub-Task 5 — Develop New Alternative Pricing Strategies and Compare Alternatives

Based in part on results of Sub-task 4 above, the team will develop new alternative pricing strategies as a way to achieve improved cost recovery. The team will then compare those alternatives with each other and with the existing pricing structure. As appropriate (depending in part on data availability), comparisons will be both quantitative (e.g., fiscal impact/sustainability) and qualitative (e.g., equity considerations). Analysis of fiscal impact will take into consideration decreases in demand given increases in prices. The team will make explicit the criteria by which it weighs alternatives. Based on this comparison, the PADCO experts will put forward a preferred alternative.

Sub-Task 6 — Develop Manual/Guidelines for Lviv and Otherwise Ensure Sustainability

The team intends to leave a positive lasting impact on Lviv Vodokanal by heightening its capacity in several ways. First, the team will develop a step-by-step process in the form of a

manual/guidelines for calculating the costs of service delivery and analyzing revenue performance. In the future, Vodokanal analysts and decision-makers will be able to use that tool as they see fit. Second, the consultancy will develop recommendations that address sustainability within Lviv Vodokanal. Those recommendations may address: creating a mechanism for periodically consulting with consumer groups regarding pricing strategy, forming an ongoing committee comprised of those in Lviv who officially set pricing policy, implementing the chosen pricing strategy, etc.²³

Sub-Task 7 — As Time Permits, Develop Other Recommendations Regarding the Vodokanal

While the focus of this consultancy is on costs and a pricing strategy, as time permits, the consultancy will make other recommendations at a general level of detail that seek to improve the financial and service performance of the Vodokanal.

Sub-Task 8 — Develop Conceptual Framework and Context

For the final report, the team will place the exercise within a conceptual framework and developmental context.

PHASE III: LVIV

The TO 57 team will perform the following tasks in Lviv.

Sub-Task 9 — Support Officials in Adopting Pricing Strategy, etc.

The team will review the draft pricing strategy, the manual/guidelines and other recommendations developed during Phase II with key decision-makers. The team will then revise those products accordingly and present them to Vodokanal and City officials for their use.

Sub-Task 10 — Address Replicability with Other Vodokanals

In consultation with USAID and other officials,²⁴ the team will recommend how to replicate the methodology developed in Lviv in other vodokanals. As noted above in the Introduction, the team will draw conclusions and make recommendations concerning any follow-on technical assistance necessary either in Lviv or elsewhere after 30 September 1995. Additionally, the manual developed during Phase II, above, will be written (and adapted as necessary) so as to serve other vodokanals in calculating costs and developing pricing strategies.²⁵

²³For the purposes of this assignment, it is assumed that developing a plan for implementing the pricing strategy as well as following through with other related recommendations, will fall outside the scope of this Task Order. One could, however, appropriately assign such responsibilities to an operations management consultant that the World Bank is expected to provide to Lviv Vodokanal.

²⁴The team assumes that all interviews will occur in Lviv, in Kiev, or within a 100 km. radius of those two cities. No overnight stays will be required outside of Lviv and Kiev.

²⁵To be most effective, such a manual must typically be tested in at least one other setting, revised, and then presented within a seminar/workshop context. Such activities, as well as extensive reproduction of the Manual, fall outside the scope presented in this document.

6 Products/Deliverables

The Task Order's major products will be:

For Ukrainian Officials as well as USAID Officials:

- a report on costs and the revenue performance of Lviv Vodokanal;
- both draft and final versions of a pricing strategy for the Lviv Vodokanal with other recommendations; and
- a manual/guidelines for calculating costs and analyzing revenues of water service provision.

Primarily for USAID Officials:

- a brief trip report from the Team Leader at the conclusion of Phase I; and
- a report on the assignment as a whole, including recommendations for follow-on technical assistance under TO 57, at the conclusion of Phase III.

Those documents targeted primarily at Ukrainian officials will be prepared in both English and in another, local language as determined by USAID/Ukraine. Those documents destined for use primarily by USAID officials will be prepared only in English. For a schedule of delivery of end-products, see below.

7 Staff

The team will consist of both expatriate and Ukrainian members, as follows:

Expat

- Team Leader / Institutional Development Specialist
- Water Utilities Financial Specialist

Ukrainian

- Financial Data Analyst

Robert Kehew of PADCO, Inc. is proposed as Team Leader / Institutional Development Specialist. Roger Hartman is proposed as Water Utilities Financial Specialist. Their résumés are attached.

As shown below, carrying out the Task Order will additionally require the participation of a Ukrainian Community Liaison Specialist. On the recommendation of USAID/Ukraine officials, that person will, however, be provided through the office of the USAID/PADCO Resident Advisor in Lviv (i.e., TO 53) rather than through Task Order 57. The office of the Lviv Resident Advisor will also provide administrative and logistical support to the Task Order 57 team.

8 Schedule

The schedule for the task order is as follows.²⁶

Phase I: Lviv (8 July - 3 August)

The Team Leader will arrive in the Ukraine on Saturday, July 8, and begin work on Monday, July 10. The Team Leader will be in communication with the Water Utilities Financial Specialist in the U.S. during the first weeks of Phase I. The Water Utilities Specialist will begin work in Lviv about 26 July. Both expats will leave the Ukraine about 3 August.

Major Deliverable

- Report on costs and revenue performance

Phase II: Washington, D.C. (7 August - 8 September)

The Team Leader will work in Washington, D.C. throughout the remainder of August. He will be joined by the Water Utilities Financial Specialist in Washington, D.C. about 4 September until 8 September.

Major Deliverables

- Draft pricing strategy with other recommendations
- Draft manual/guidelines

Phase III: Lviv (10 - 30 September)

The expat team members will arrive in Lviv about 10 September, will begin work on 11 September and will stay in the Ukraine until 30 September.

Major Deliverables

- Final translated pricing strategy and other recommendations
- Translated manual/guidelines
- Report for USAID

(NOTE: The report for USAID will be prepared and submitted in Ukraine in September 1995. If USAID should wish to treat that document as a draft report rather than a final document and provides comments, the team will revise and finalize that report in Washington, D.C. in October/November 1995. That activity is, however, not included as part of these Terms of Reference.)

9 Level of Effort

²⁶The focus of the schedule provided is on expat travel. All dates are for 1995 and are approximate and illustrative.

To carry out the assignment in the time available, PADCO proposes a six-day work week for expat consultants and a five-day work week for Ukrainian consultants. LOE required by phase and by sub-task will be as follows.

9.1 LOE by Phase

	Phase I	Phase II	Phase III		Total
<i>Expat</i>					
Team Leader / Instit. Dev't. Specialist	22(2)	20	17(2)	=	63
Water Utilities Financial Specialist	11(2)	5	17(2)	=	37
Subtotal				=	100
<i>Ukrainian</i>					
Financial Data Gatherer / Analyst	19	0	15	=	44
Community Liaison Expert ²⁷	(10)	0	(4)	=	(14)
TOTAL LOE (not including Comm. Liaison Exp.)					144

NOTES: Numbers in (parentheses) are travel days.

9.2 LOE by Sub-Task²⁸

<u>Phase/Sub-Task</u>	<u>Team Lead. Instit. Dev't.</u>	<u>Water Utils. Financ. Spec.</u>	<u>Financial Data An.</u>	<u>Comm. Liais²⁹</u>
<i>Phase I</i>				
1. Data Gathering	9	3	12	—
2. Description of Setting	4	—	—	—
3. Costs / Evaluate Performance	6	8	7	—
4. Consultation Plan	3	—	—	(10)
Travel	<u>2</u>	<u>2</u>	<u>—</u>	<u>—</u>
Subtotal	24	13	19	(10)
<i>Phase II</i>				
5. Alternative Pricing Strategies	1	4	—	—
6. Manual/Sustainability	10	—	—	—
7. Other Recommendations	5	1	—	—
8. Conceptual Framework	<u>4</u>	<u>—</u>	<u>—</u>	<u>—</u>
Subtotal	20	5	0	(0)
<i>Phase III</i>				

²⁷As discussed with USAID/Ukraine, LOE for a Community Liaison Expert will not be funded under TO 57, but rather under TO 53.

²⁸Numbers are indicative of areas of primary responsibility for each team member.

²⁹As discussed with USAID/Ukraine, not funded under TO 57 but under TO 53.

9. Support Adopting Strategy	5	12	10	(4)
10. Address Replicability	12	5	5	—
Travel	<u>2</u>	<u>2</u>	<u>—</u>	<u>—</u>
Subtotal	19	19	15	(4)
 TOTAL	 63	 37	 44	 (14)

The Team Leader will be responsible for the overall success of the assignment, and will review and edit all deliverables.

10 Budget

See attachment.

APPENDIX B

CURRENT PRICING PROCESS

This Appendix presents the current pricing process for Lviv Vodokanal. The pricing process is illustrated by the most recent calculations of prices, performed in May 1995.³⁰

The pricing process followed by Lviv Vodokanal includes two major steps:

Step 1.	Determine total and average costs of service
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Step 2.	Following State and Oblast guidelines, design pricing structure to recover costs
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These two steps are elaborated below.

11 Determine Total and Average Costs of Service

Step 1 consists of several sub-steps, as follows:

Step 1.	Determine total costs of service and average cost per cubic meter of water: <ul style="list-style-type: none">(i) Project future expenditures(ii) Estimate future expenditures-plus-taxes(iii) Regarding water production and delivery, project:<ul style="list-style-type: none">(a) total water production(b) water delivery to different customer classes(c) total water delivered and total water loss(iv) Divide future expenditures by total water delivered to arrive at average cost per cubic meter
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Sub-step 1(i): Project future expenditures. Expenditures, referred to as “total production costs,” correspond to operations and maintenance and renewal and replacement costs. In estimating future expenditures, Lviv Vodokanal begins by comparing actual gross current expenditures to planned expenditures.³¹ Gross expenditures are broken down into 13 categories that represent direct and indirect inputs into production. These 13 categories are: fuel, raw materials, electro-energy, depreciation of capital assets, salary, tax on salary, repairing fund, upper floors

³⁰See Appendix D for these calculations.

³¹See Appendix D, p. 5.

pumping, workshop, general expenditures, bought water, geological research, and other. These categories are based loosely on Cabinet of Ministers Decree No. 759,³² which defines direct production costs. Each line item corresponds to one manually compiled Journal where expenditures are recorded. For January-March 1995, electro-energy accounted for a full three-fourths (76.8%) of actual total costs.

Depreciation of capital assets, and indexation of assets to allow for inflation, is manually calculated according to a ministerial Procedure.³³ To calculate depreciation, the State provides a schedule with estimates of the useful service life of different assets. If the useful service life of an item is shown as eight years, for example, the vodokanal depreciates the value (beginning from time of purchase) evenly by one-eighth every year for eight years. If the item remains in service after eight years, depreciation is no longer calculated.

Vodokanal next projects future expenditures for the line items. The May 1995 document projected expenditures for May-June 1995. This calculation consisted of two elements: (i) a projection based on historical trends, and (ii) a projection of "additional expenses," including a recent increase in the cost of electro-energy. Lviv Vodokanal projected total gross expenditures for the May-June 1995 period to be 109,373 million coupons (US\$714,856³⁴) per month.

*Sub-step 1(ii): Estimate future expenditures plus certain taxes.*³⁵ In this sub-step,³⁶ vodokanal first adds an additional 25 percent to the total from sub-step 1(i). Following a Decree of the Lviv Oblast, this margin (referred to as "profit") is collected for "social protection of the population,"³⁷ such as Chernobyl victims. (Following agreement with Lviv Oblast, however, twenty-five percent of those "profits" are remitted or retained by City officials.)

Lviv Vodokanal next increases this new subtotal by 20 percent to pay the value-added tax. Finally, to arrive at total future costs, one adds other "obligatory fees," which consist of the road tax, labor protection tax, and the innovation fund. Lviv Vodokanal estimated total future

³²Cabinet of Ministers Decree No. 759, *Main Statements on the Production Costs Estimations for Enterprises and Organizations*, 10 November 1994.

³³Ministries of Statistics, Economics, Finance, and the State Property Fund, *Procedure of the Fixed Production Assets Balance Cost Indexation by January 1, 1995*.

³⁴One dollar U.S. = C. 153,000.

³⁵This sub-step can be expressed as follows:

$$TC = TPC + P + VAT + OP$$

where:

TC	=	total costs
TPC	=	total production costs permitted under Decree No. 759
P	=	allowable "profit" (0.25 x TPC)
VAT	=	value-added tax (0.20 x (TPC + P))
OP	=	other obligatory payments (taxes and fees, etc.)

³⁶See Appendix D, p. 5 and p. 12.

³⁷President Representative of Lviv Oblast, *Decree: Regulation of Tariffs for Communal Services*, 7 April 1994.

expenditures for the May-June 1995 period to be 168,435 million coupons (US\$1,100,880) per month.

*Sub-step 1(iii): Make projections for water production and delivery.*³⁸

(a) *Total water production.* This projection is based on historic records of water production. Total production for the May-June period is expected to be 12,483,000 cub. meters/month.

(b) *Water delivery to different customer classes.* The four major customer classes defined by the Vodokanal are as follows:

- general population
- organizations on Lviv City budget (e.g., local government)
- communal service providers (e.g., banks, gas stations, etc.)
- enterprises/industries

Officials estimate water delivery based on norms,³⁹ meetings with certain customers, records and estimates provided by zheks, and meter readings when available.

(c) *Total water delivered and total water loss.* Vodokanal officials then add up water expected for delivery to different customers to arrive at total water delivered. The difference between water production and delivery is water loss. As a double check, officials compare this result with their expectation of about 20 percent of water produced to be lost. Total water delivered for the May-June 1995 period is projected at 10,017,000 cub. meters/month — about 80 percent of total water produced, with an estimated 20 percent loss.

Sub-step 1(iv): Calculate average cost per cubic meter. This calculation is simply total future expenditures divided by total water delivered. Vodokanal refers to this figure as “average cost.” For the May-June 1995 period, the calculation was C. 168,434.7 million divided by 10,017,000 cub. meters, to arrive at C. 16,815 (US\$0.11) per cubic meter.

³⁸See Appendix D, p. 10.

³⁹Lviv Vodokanal uses the following norms for water use for this calculation: **where both hot and cold water is supplied** — 9.1 cub. meters per person per month; **where only cold water is supplied** — 5.8 cub. meters/person/month; **where no bathtub is provided** — 3.3 cub. meters/person/month. These norms are based on State Committee of Housing and Communal Services, *Regulation of Water Supply and Wastewater System Usage in Cities and Villages of Ukraine*, ratified 1 July 1994.

12 Following State and Oblast Guidelines, Design Price Structure to Recover Costs

As with Step 1, Step 2 is also broken into several sub-steps as follows:

- | | |
|---------|--|
| Step 2. | <p>Following State and Oblast guidelines, design pricing structure to recover costs:</p> <ul style="list-style-type: none"> (i) Set prices for those customer classes where State and Oblast guidelines and historical precedents prevail (ii) Project revenue generated by those sources (iii) Set price for industry so as to recover remainder of projected expenditures |
|---------|--|

Sub-step 2(i): Set prices for those customer classes where State and Oblast guidelines and historical precedents prevail. According to an agreement worked out between Lviv Vodokanal and Lviv Oblast, the user charge for **communal service providers** is set at roughly the “average cost.” Thus, for the May-June 1995 period, the tariff for communal service providers is set at C. 16,800 per cub. meter (for full price structure see Table 2.1).

For the **general population**, the user charge is set at 30 percent of the “average cost.” This is based on a requirement of Cabinet of Ministers Decree 733 that the population progressively assume more of the costs of service. Thus for the May-June 1995 period, the user charge for the general population is fixed at C. 5,050 per cub. meter (approx. $16,815 \times 0.3$).

For the **Lviv budget organizations**, their charge is set equal to the charge for the general population plus a margin for the value-added tax.⁴⁰ Thus for the May-June 1995 period, the charge for these organizations is C. 6,070 ($5,050 \times 1.2$).

Lviv Vodokanal finally accounts for several additional **parts of the general population** that receive favorable treatment. For example, war veterans pay 25 percent of the charges assigned to the general population, persons identified as persecuted pay 50 percent of general population charges, etc. For the May-June 1995 period for those two groups, those tariffs would be about C. 1,270 and C. 2,530 per cub. meter, respectively.

Sub-step 2(ii): Project revenue generated by those sources. Vodokanal officials next calculate the revenue expected from the sources treated in sub-step 2(i).⁴¹ From those sources (communal service providers, the general population, and Lviv budget organizations) for the period May-June 1995, Vodokanal expects to generate a total of about C. 39,651.5 million per month (US\$259,160).

⁴⁰The Director of the Lviv Vodokanal Department of Economics notes that this practice follows a non-ratified norm of the Lviv Oblast. Interview 24 July 1995.

⁴¹See Appendix D, p. 12.

Sub-step 2(iii): Set price for industry so as to recover remainder of project expenditures.

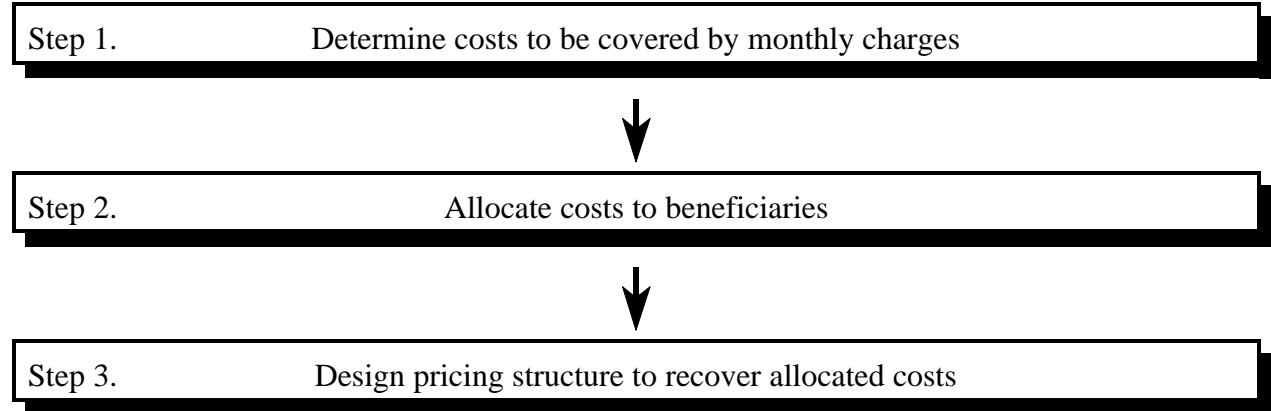
Officials next subtract those revenues estimated in sub-step 2(ii) above from total projected revenues. This revenue shortfall must be generated by the remaining customer class: enterprise/industry water users. Those outstanding funds are divided by the water that those customers will use to arrive at a per cub. meter price. Thus for the May-June 1995 period, Vodokanal must generate about C. 128,783.2 million (US\$841,720) per month from enterprise/industry to meet expected expenditures (C. 168,434.7 million less C. 39,651.5 million). Dividing that amount by projected water sales to industry of 842,000 cub. meters per month yields the necessary tariff of C. 153,000 per cubic meter for industry.

Review and Approval. Following preparation by Lviv Vodokanal, a proposed new pricing structure is submitted to the City of Lviv and to Lviv Oblast. The Oblast Executive Committee signs the pricing structure for approval. The external review and approval process generally takes one to two weeks.

APPENDIX C

MODEL PRICING PROCESS

The model pricing process⁴² introduced in this document includes three steps:



Those steps are elaborated below.

13 Determine Costs to Be Covered by Monthly Charges

The model pricing process generally follows marginal cost principles. When we set the price for water service equal to marginal costs, we send the correct price signal to use water efficiently. If prices are too high, we in effect sell too little water. If prices are too low, we sell too much water.

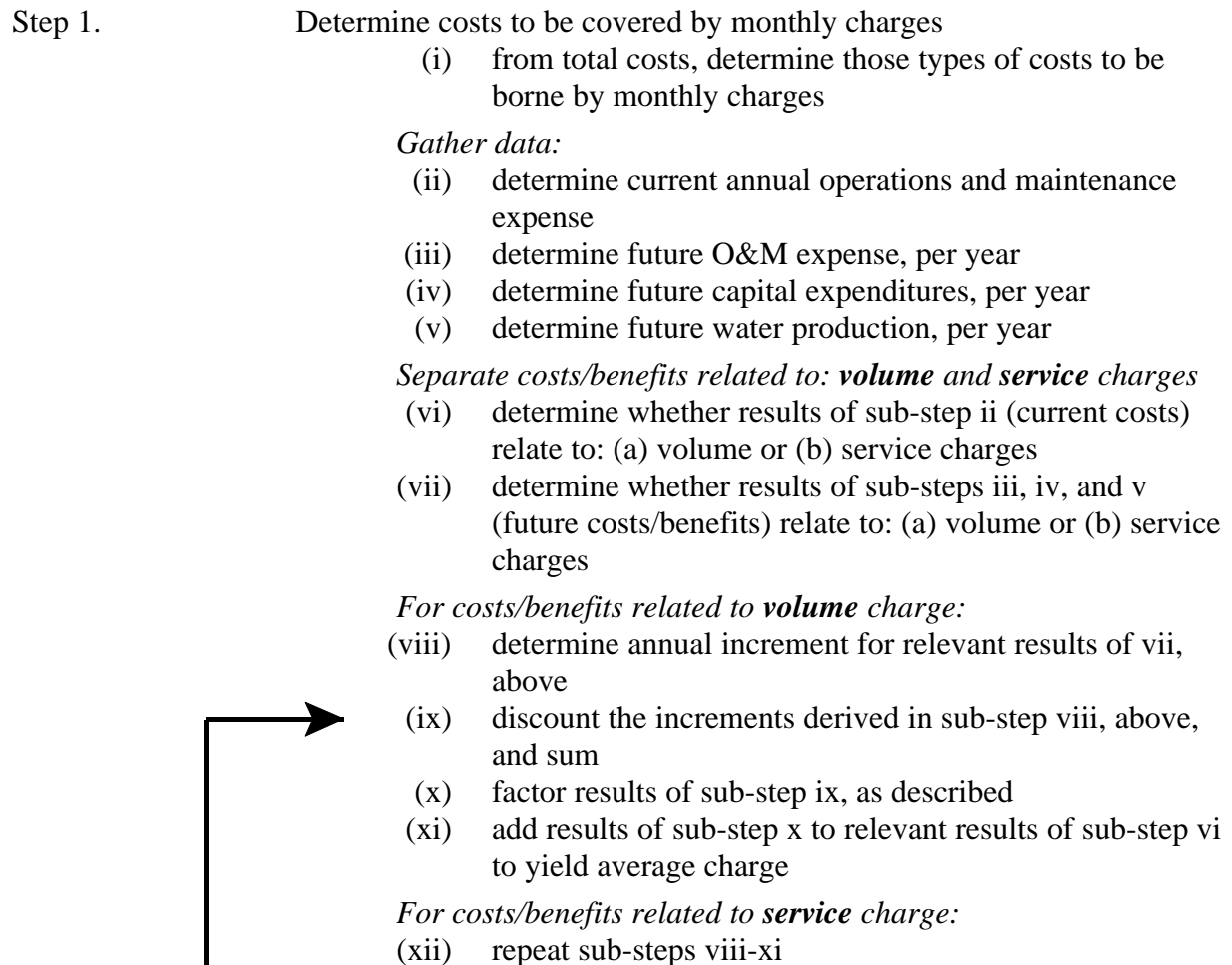
The marginal cost of water is the cost of producing and selling **the next** unit of water. Thus, this approach to price-setting is forward-looking, rather than based on sunken or historical costs, as are other approaches. Because it is based on future conditions, calculating marginal costs involves projecting capacity and operating costs for a future time span.

In practice, it is not practical to set water prices exactly equal to the marginal cost. The average incremental cost (AIC) approach offers a reasonable way to approximate the marginal cost of water. The AIC definition gives cost estimates that avoid the severe price fluctuations that a purely marginal cost approach to water pricing would produce. Even as early as 1977, the World Bank was using the AIC definition in many water supply projects.⁴³

⁴²The model pricing process presented is derived from several sources. See Sanders, Robert; Warford, Jeremy; and Mann, Patrick, *Alternative Concepts of Marginal Cost for Public Utility Pricing: Problems of Application in the Water Supply Sector*, World Bank, Staff Working Paper No. 259, May 1977; Bahl, Roy W.; and Linn, Johannes F., *Urban Public Finance in Developing Countries*, World Bank, 1992; and American Waterworks Association, *Water Rates*, 1991.

⁴³Sanders, Robert; Warford, Jeremy; and Mann, Patrick, *Alternative Concepts of Marginal Cost for Public Utility Pricing: Problems of Application in the Water Supply Sector*, World Bank, Staff Working Paper No. 259, May 1977, p. 26.

The steps in the model pricing process using the AIC approach are as follows:



Sub-step 1(i): ~~From total costs~~, determine those types of costs to be borne by monthly charges. This sub-step involves a policy-level decision about the role that monthly charges should play in the overall financial model for providing water service. Some costs may be covered by other charges (e.g., lump-sum connection charge, lump-sum development charge⁴⁴), as well as other funding sources (e.g., general revenues, grants). The model pricing approach, presented below, only addresses monthly charges.

Gather data

Sub-step 1(ii): Determine current annual operations and maintenance expense. Operating expenses include costs incurred in producing and transmitting potable water. Maintenance costs include requirements caused by wear and tear on the plant during operation. Operations and maintenance (O&M) expenses include labor costs.

⁴⁴For a description of these other types of charge and their application, see *Volume II, Lviv Vodokanal: Improving Cost Recovery*, Chapter 1.

Sub-step 1(iii): Determine future annual O&M expense, per year;

Sub-step 1(iv): Determine future annual capital expenditures, per year.

Sub-step 1(v): Determine future annual water production, per year.

The data needed for sub-steps 1(iii), 1(iv), and 1(v) obviously derive from medium- and long-term projections of water demand and capital and financial plans and programs. These capital and financial plans should treat system extension and expansion, as well as renewal and replacement of the current system. The plans should not only yield information regarding the cost of capital expenditures, and when those outlays should occur, but also the impact of those investments on water production. (Note: The model pricing approach is concerned with water production as it is projected to come on-line in response to demand, not with total capacity of production.) Future annual O&M expenses should also be projected. One notes that annual O&M and capital expenses will both be developed in money units, while water production will be expressed in volumetric terms (e.g., cubic meters). Data for sub-steps 1(iii), 1(iv), and 1(v) should all be developed for the same planning horizon (e.g., 20-year period).

Separate costs/benefits related to: (a) volume and (b) service charges

Sub-step 1(vi): Determine whether results of sub-step 1(ii) (current costs) relate to: (a) volume or (b) service charges. The model methodology recognizes two distinct monthly charges. The **volume** charge reflects costs that vary, depending on the amount of water consumed. The **service** charge, on the other hand, includes costs that remain fixed and do not vary depending on the volume of water consumed. Service charges often include costs associated with billing, customer service, administration, etc.

Sub-step 1(vii): Determine whether results of sub-steps 1(iii), 1(iv), and 1(v) (future costs/benefits) relate to: (a) volume or (b) service charges. At this point, data derived above should have been entered in a spreadsheet, organized by year. We then divide each of the three components — O&M expense, capital investment, and water production — into two columns: (a) volume- or (b) service-related. Below we deal first with the volume-related data, and second with the customer service-related information.

For costs/benefits related to volume charge:

Sub-step 1(viii): Determine annual increment for relevant results of sub-step 1(vii), above. We determine the incremental change from year to year for the appropriate columns.

Sub-step 1(ix): Discount the increments obtained in sub-step 1(viii), above, and sum. Now we calculate the net present value (NPV) for each future year of the incremental costs/benefits for O&M expense and capital investment. Then we sum each of these streams of costs/benefits to obtain total NPV for each item.

Sub-step 1(x): Factor results of sub-steps 1(ix), as described. For a given year, calculate:

$$\frac{\text{Total NPV of incremental O\&M expense} + \text{Total NPV of incremental capital investment}}{\text{Total incremental water production}}$$

(This formula expresses the AIC identity.) The result may be expressed in dollars (or coupons) per cubic meters.

Sub-step 1(xi): Add results of sub-step 1(x) to relevant results of sub-step 1(vi) to yield average monthly charge.

For costs/benefits related to service charge:

We now repeat sub-steps 1(viii) through 1(xi). The first time we were concerned only with volume-related charges. We now address only service-related charges.

At this point, we have arrived at a monthly volume charge and a monthly service charge. Both are for the present year; both reflect an AIC approach. The volume charge can be expressed in coupons (or dollars) per cubic meter, while the flat service charge is the same for each customer. The volume charge developed thus far is an average; that is, it assumes that all customers place equal demands on the water system. This assumption will be eliminated in the next step.

14 Allocate Costs to Beneficiaries

The second step in the model pricing process is to allocate costs to beneficiaries. This step can be broken down into the following sub-steps.

Step 2.	Allocate costs to beneficiaries
	(i) divide costs into primary cost components: base costs, extra capacity costs, and direct fire protection costs
	(ii) define customer classes and allocate costs

Step 2 recognizes that “[f]ollowing the general principle of efficient pricing, water users should be charged equally if they impose equal marginal costs on the system, but should be charged differentially if marginal costs differ.”⁴⁵ Customer demand patterns and resulting costs do, indeed, vary. Thus, in Step 2, we will continue refining the volume charge. (The customer service charge, derived in Step 1, will, however, remain unchanged.)

Step 2(i). Divide costs by function and component. We first divide cost items up by function. Those functional categories may be: supply; treatment; transmission/distribution; fire protection; and customer services, billing, and administration. We next divide cost items up into primary components. We use the following definitions:

- *Base costs* are costs that tend to vary with the total quantity of water used under **average** load conditions. Base costs thus do **not** include additional costs incurred to meet **variations** in water use and peak demand. Base costs generally include O&M expenses of supply and a portion of costs related to treatment, pumping, and distribution facilities. They also include capital costs associated with serving customers for a constant, or average, annual rate of use.

⁴⁵Bahl, Roy W.; and Linn, Johannes F., *Urban Public Finance in Developing Countries*, 1992, p. 302.

- *Extra capacity costs* are expenses associated with meeting variations in water use. They include O&M expenses and capital costs associated with providing the extra system capacity needed to meet these variations. Extra capacity costs may be subdivided into costs necessary to meet: (a) maximum-day extra demand and (b) maximum hour demand.
- *Direct fire-protection costs* are those costs associated with providing fire protection. They include the capital and maintenance costs of public fire hydrants and related branch mains and valves.

Sub-step 2(ii): Define customer classes and allocate costs. We next allocate costs broken down above to customer classes. One tries to break customers down into classes that have similar water-use characteristics. These characteristics include service needs, demand patterns, and whether customers are located within or outside city limits. The following examples illustrate how costs may vary by customer class.

- Some customers require treated water, while others are satisfied by less costly raw water.
- Certain customers require more water during the summertime, while other users need water on a uniform basis throughout the year, which costs less.
- Some industries may produce larger quantities of products at certain times of the year, or change their product line frequently. Other industries may manufacture the same product in equal volumes all year long, requiring steady volumes of water, which is less expensive.

As a step toward rate design, one usually expresses the allocation of costs to customer classes in terms of cost per cubic meter.

15 Design Pricing Structure to Recover Allocated Costs

The third step in the pricing process is designing a pricing structure to recover allocated costs. This activity is divided into several sub-steps as follows:

- | | |
|---------|--|
| Step 3. | <p>Design pricing structure to recover allocated costs:</p> <ul style="list-style-type: none"> (i) determine objectives and major characteristics of structure (ii) develop monthly service charge to recover customer service costs (iii) design block rates to recover base costs and extra capacity costs (iv) develop rates to recover direct fire-protection costs (v) calculate if initial design (sub-steps ii-iv) will meet revenue requirements, and modify if necessary |
|---------|--|

These sub-steps thus correspond closely with the primary cost components (e.g., customer costs, etc.) that we defined in Step 2, above.

Sub-step 3(i): Determine objectives and major characteristics of structure. One first determines the objectives and major characteristics of the pricing structure.⁴⁶ The pricing structure should allow the utility to operate on a self-sustaining basis, as well as meet other goals and objectives of the utility and the community.

A major decision about the pricing structure involves whether: (1) different classes of customers face separate rate schedules or (2) all customer face the same rate schedule.

A second decision involves whether each rate schedule has two parts or just one part. In a two-part rate schedule, there is first an initial service charge that just recovers customer costs. This charge stays the same regardless of how much water a customer consumes. Second, there are charges that vary depending on water use. In a one-part rate schedule these two elements are combined into one charge that varies with water consumption.

Another decision involves whether a given customer will pay the same rate for every cubic meter of water he or she consumes, or whether that rate will change as volume of use increases. If the rate per cubic meter is to change, the rate schedule is broken up into “block rates.” For example, if the price is ‘x’ for the first 1,000 cub. meters that all customers consume per month, the price may be ‘2x’ for the second 1,000 cub. meters that they use, and ‘3x’ for any additional water consumed. We then say that the rate schedule is broken into three block rates. One notes that the rate per cubic meter can either increase or decrease as volume of use goes up.

Other decisions can involve charging higher rates during the summertime, when water use is higher; or charging different rates for customers who live outside the jurisdictional (city) limits.

Of course, in setting the major characteristics of a **new** pricing structure, one has to bear in mind the **existing** structure and what changes can be accomplished without too much resistance.

*Sub-step 3(ii): Develop monthly service charge to recover **customer service** costs.* This sub-step involves calculating a monthly charge to recover customer service costs. This calculation may simply involve dividing unit service costs evenly among all water users.

*Sub-step 3(iii): Design block rates to recover **base costs** and **extra capacity costs**.* This sub-step entails developing block rates to recover costs related to volume of use (base costs) and extra capacity. One first defines the limits for the block rates, and then sets the rates for each block. The rate structure should correspond to the objectives set above. For example, if water conservation is a key objective, the rate per cubic meter for minimal monthly water use may be kept low. Customers may, however, pay a premium for water use that exceeds minimum requirements.

*Sub-step 3(iv): Develop rates to recover **direct fire-protection costs**.* Sub-step iv involves providing for direct fire-prevention costs. After calculating those costs, one has to determine which customers will shoulder those costs.

⁴⁶Objectives and major characteristics are discussed briefly below. Further discussion available if necessary.

Sub-step 3(v): Calculate if initial design (sub-steps ii-iv) will meet revenue requirements, and modify if necessary. After going through sub-steps 3(ii)-3(iv) and designing an initial rate structure, one has to calculate whether that preliminary rate structure will meet revenue requirements and other objectives of the water authority. If not, the initial rate structure should be revised until the designer is satisfied it will provide the revenues required and meet other objectives.

APPENDIX D
PROPOSAL FROM LVIV VODOKANAL TO LVIV OBLAST FOR
CHANGE TO USER CHARGES (MAY 1995)
